Sequential sampling for Douglas-fir tussock moth egg masses in British Columbia

by

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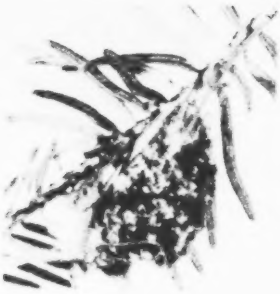
New egg mass

About 200 white, round, eggs are glued on the lower side of the cocoon with a frothy cement and covered with a smooth layer of dark-gray hairs and scales from the female's body.



Hatched egg mass

The egg-mass surface appears rough and broken with a jumbled mixture of white eggs and dark gray hairs. Some eggs are hatched and split open.

Cocoon

Light-gray mass of silk woven to form a sack-shaped cover around a pupa.

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Purpose

This field guide describes an easy-to-use survey for determining egg-mass density in stands infested with Douglas-fir tussock moth. The results of this survey, which should be conducted in the fall, are used to predict defoliation for the following year. This guide is designed for field use by forestry staff and/or landowners in areas where tussock moth outbreaks occur.

Douglas-fir tussock moth is a periodic defoliator of Douglas-fir. Infestations are cyclic, usually lasting 1 to 4 years in any particular stand. Outbreaks occur somewhere in the Okanagan or Thompson River valleys of British Columbia every 8 to 14 years. During periods of severe defoliation, other tree species such as ponderosa pine are also attacked but rarely killed. Increases in tussock moth populations are rapid and result in sudden and severe tree damage. Complete loss of foliage in the center of defoliated stands, with accompanying growth loss, top kill and some tree mortality, is common in the first year of an infestation. It is important, therefore, to locate and assess populations **before** they cause severe damage. Treatment can then be carried out in time to prevent or minimize defoliation, rather than respond to the problem after the damage is done.

Pheromone traps maintained at key locations by the Forest Insect and Disease Survey of the Canadian Forestry Service will provide a warning when tussock moth populations are approaching outbreak levels. However, pheromone traps do not tell the exact location of the outbreak or of the level of expected defoliation. The latter information can be col-

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lected with the aid of this sequential egg-mass sampling method.

This survey method is designed for use on increasing tussock moth populations **before** there is noticeable defoliation of its main host tree, Douglas-fir. After severe defoliation, the egg-mass distribution over the tree crowns is changed from that of non- or lightly-defoliated trees. Also, this method is designed for use in the autumn as some of the egg masses are lost through the winter. Therefore, data collected from partially defoliated crowns or from spring surveys cannot be interpreted from the information given in this report.

A reference to the detailed description and background data used to derive the sequential sampling system as well as other useful references are given.

Life history of the Douglas-fir tussock moth

Douglas-fir tussock moth eggs hatch just after bud flush in late May or early June. Larvae initially feed on the new foliage but when larval densities are high and most of the new foliage is destroyed they backfeed on older foliage. Mature larvae spin cocoons and pupate in late July or early August on the underside of foliage and branches. Sedentary, wingless females emerge in August, and attract and mate with winged males. The females lay egg masses on the cocoons from which they emerged and cover them with body hairs and scales. Egg laying is usually completed by mid-September and the insects over-

winter as eggs.

Larvae can disperse over short distances by crawling and by drifting on silk threads carried by wind to surrounding trees. This lack of a long-distance dispersal stage results in small areas with high larval densities and a patchy distribution of defoliation during the first year of an outbreak. In subsequent years these patches get bigger and may coalesce.

How to conduct the survey

1. In the fall, after pheromone traps have indicated that Douglas-fir tussock moth egg masses may be present, examine all susceptible stands with little or no defoliation which are in the vicinity of the pheromone traps.

2. Walk through the susceptible stands looking on the lower side of branches for egg masses. Be careful not to confuse old, previously hatched egg masses or cocoons for new, viable egg masses (see photographs inside front cover).

3. When new egg masses are found, search for the area where egg-mass density appears to be highest and mark the center of the infestation.

4. Select, at random, 20 Douglas-fir trees around the infestation center which have at least three full-sized lower branches close enough to the ground so that new egg masses can be easily seen. Count the number of egg masses on the three lower branches and record the number

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found per tree cummulatively on a tally card.

5. Continue sampling until the total number of egg masses is 40 or greater, or until the egg-mass density is equal to or lower than the lower stop density indicated on the card, for example, 5 egg masses for 20 trees.

6. Calculate the average number of egg masses per tree and determine the predicted defoliation. Circle predicted defoliation class: L, M, S for light, moderate or severe. Sketch the stand location on the reverse side of the tally card, identifying the infestation center, the boundaries of the stand and the infestation, and any prominent landmarks. Include a scale and the direction of true north. Remember, another person may have to find the infestation a year later.

WARNING: Handling of cocoons or egg masses may cause an itchy rash or other allergic reaction.

Interpretation of results

This system is designed to determine the average number of egg masses per three lower branches per tree within 20% of the true average, 95% of the time. It is the point of highest egg-mass density within the stand which is surveyed, so the resulting defoliation predictions are for the worst spot. It is not a stand average and, in most cases, the rest of the stand will have less defoliation.

If the average number of egg masses on the three lower branches of each tree is:

Less than 0.7, then you can expect light defoliation (L) or no defoliation at all in that stand the following year.

Between 0.7 and 1.9, then you can expect moderate defoliation (M). The defoliation will be highly variable in intensity between trees. Some growth loss is likely to occur.

More than 2.0, then you can expect severe defoliation (S) and significant growth loss. Some top kill and tree mortality may also be expected.

Recommended reading

Brooks, M.H., R.W. Stark and R.W. Campbell. 1978. The Douglas-fir tussock moth: a synthesis. U.S.D.A., Technical Bulletin 1585, 331 p.

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Douglas-fir tussock moth egg-mass survey

Plot # _____ Location _____

Observer _____ Date _____

Tree #	# Egg Masses	Cumulative # Egg Masses	Lower Stop #
2			–
4			–
6			–
8			–
10			–
12			–
14			–
16			–
18			–
20			5
22			5
24			6
26			8
28			9
30			10
32			11
34			12
36			13
38			14
40			15
42			17

Tree #	# Egg Masses	Cumulative # Egg Masses	Lower Stop #
44			18
46			19
48			20
50			21
52			22
54			23
56			24
58			26
60			27
62			28
64			29
66			30
68			31
70			33
72			34
74			35
76			36
78			37
80			38
82			39

Stop sampling when cumulative egg masses reaches 40 or is equal to or below lower stop number

Total # egg masses _____ _____ _____

trees

Predicted Defoliation

L M S

Map overleaf